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Title: 239Pu(n,f) PFNS evaluation: potential release candidate.

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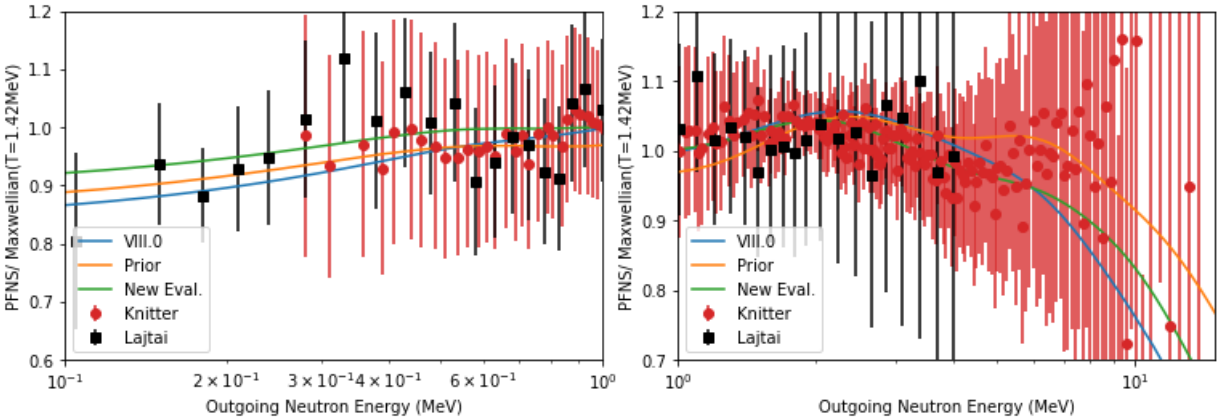
Los Alamos
NATIONAL LABORATORY

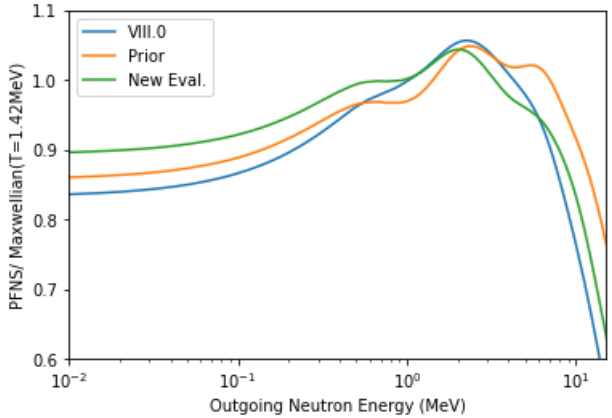
^{239}Pu(n,f) PFNS evaluation: potential release candidate.

D. Neudecker

March 30 – April 17, 2021

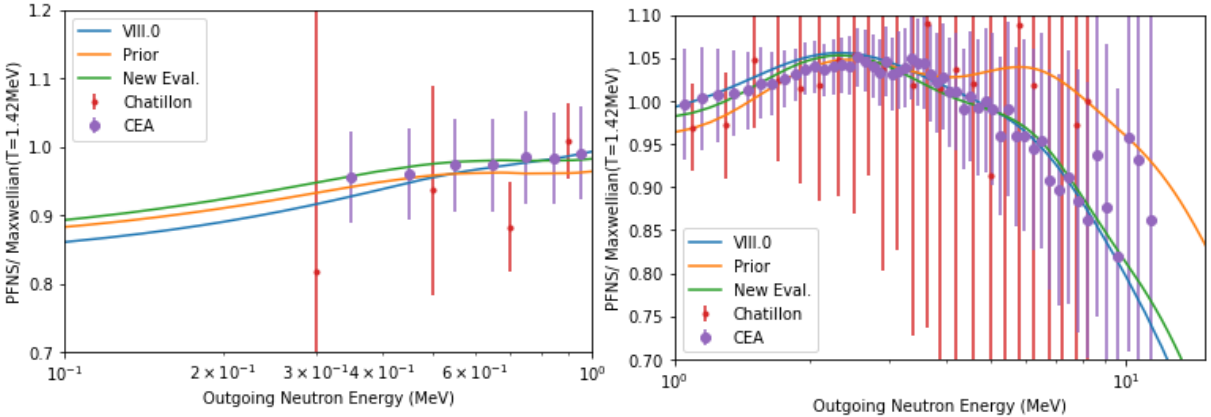
^{239}Pu(n,f) PFNS E_{inc}= 500 keV, Mean energy: 2.106 MeV

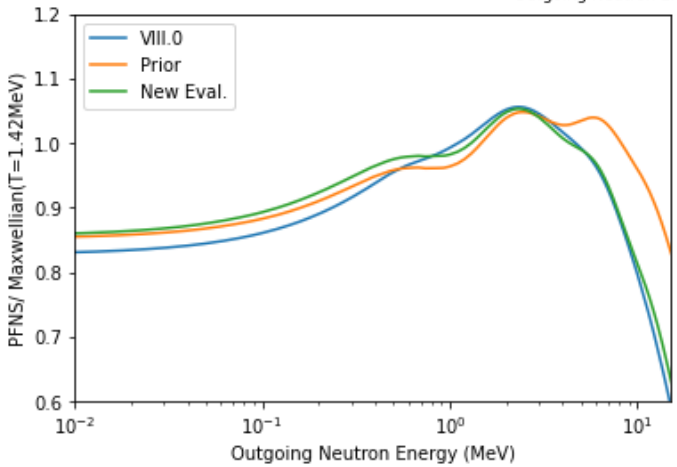




- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - Knitter at E_{inc} = 1.5 MeV,
  - Lajtai at E_{inc} = thermal (only for extending to lower E_{out}, very large unc.).

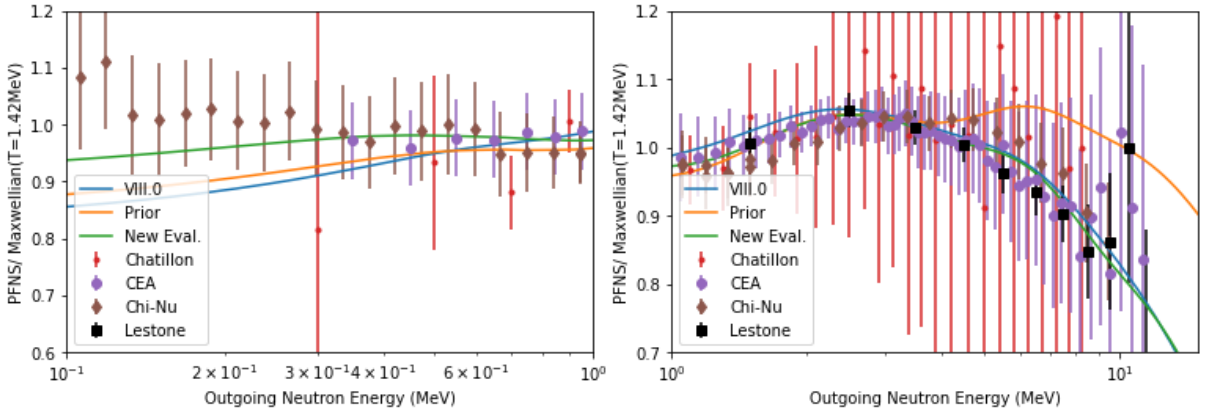
^{239}Pu(n,f) PFNS E_{inc}= 1 MeV, Mean energy: 2.131 MeV

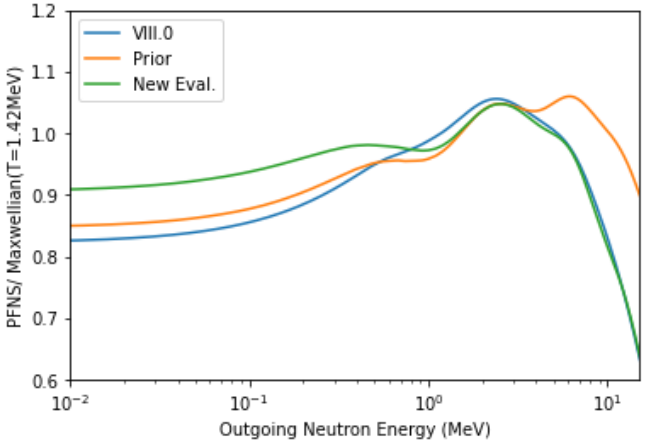




- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chatillon at E_{inc} = 1.5 MeV.

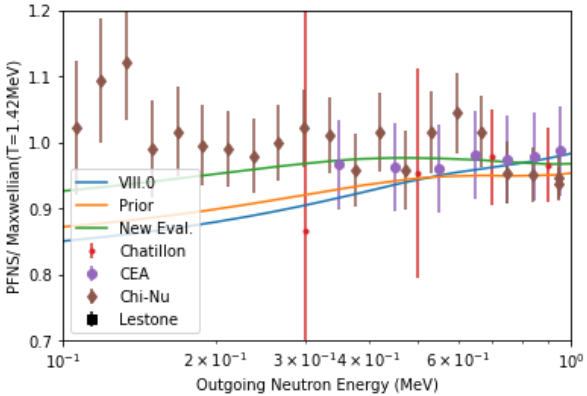
^{239}Pu(n,f) PFNS E_{inc}= 1.5 MeV, Mean energy: 2.133 MeV

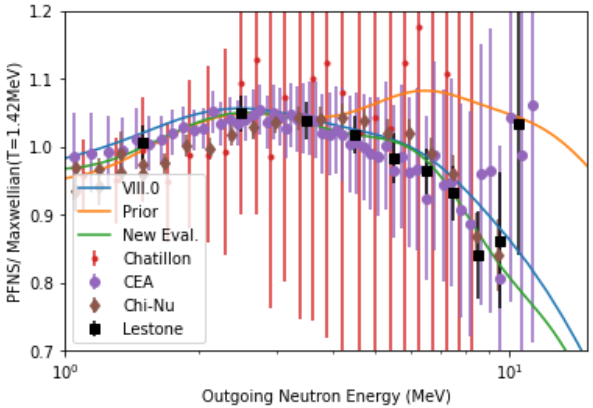


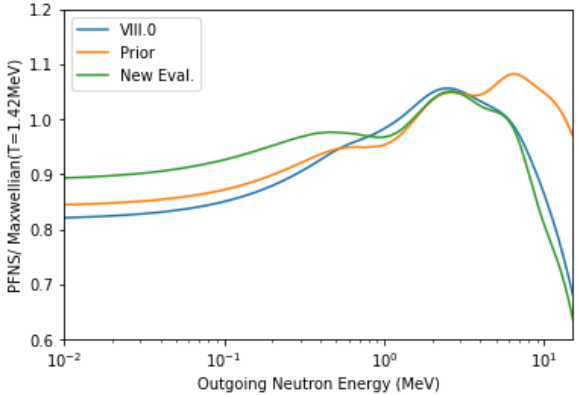


- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Lestone at E_{inc} = 1.5 MeV,
  - Chatillon at E_{inc} = 1.5 MeV.

^{239}Pu(n,f) PFNS E_{inc}= 2 MeV, Mean energy: 2.142 MeV

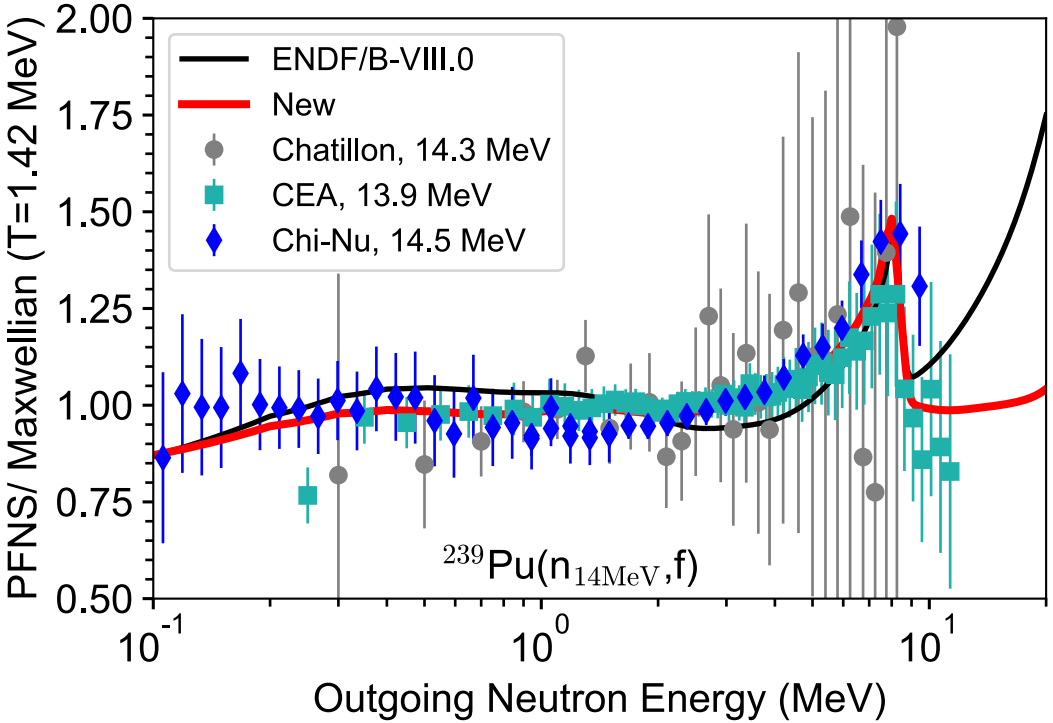






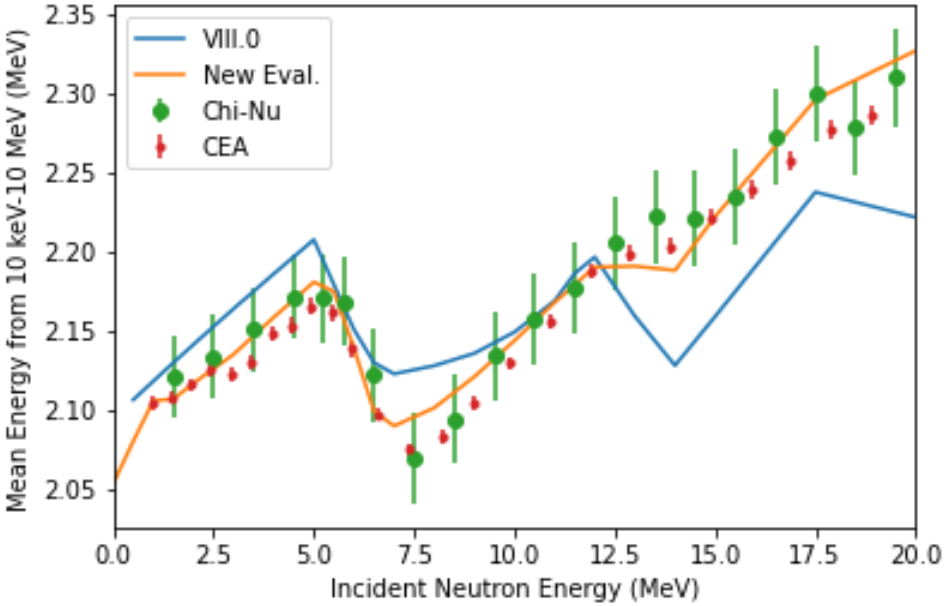
- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Lestone at E_{inc} = 2 MeV,
  - Chatillon at E_{inc} = 2.5 MeV.

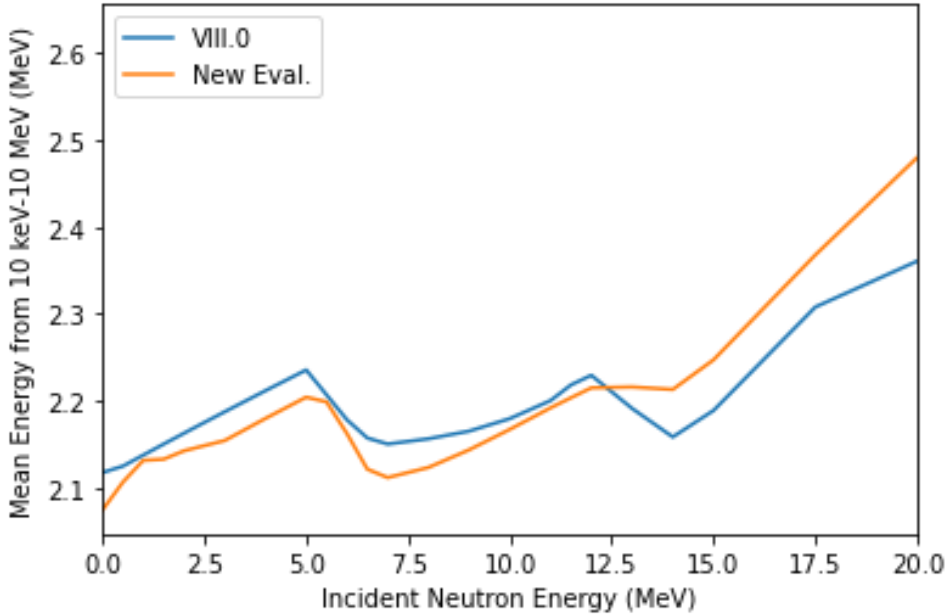
^{239}Pu(n,f) PFNS E_{inc}= 14 MeV, Mean energy: 2.213 MeV



- Evaluation from 3-30 MeV.
- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Chatillon.

Mean energy continuity:



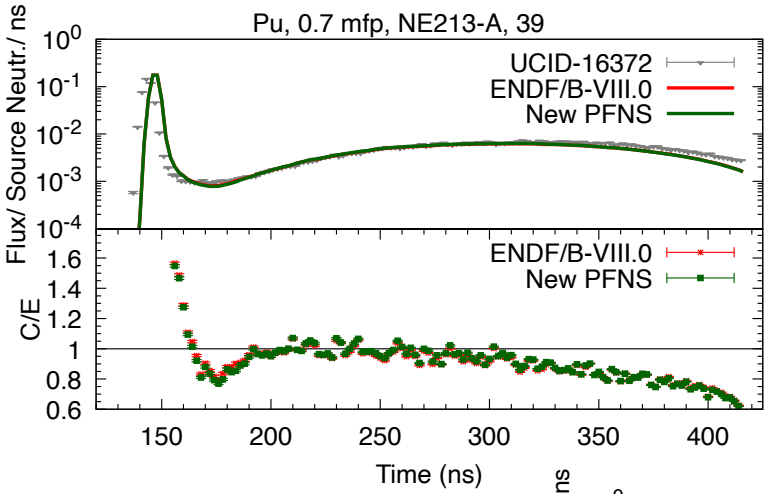


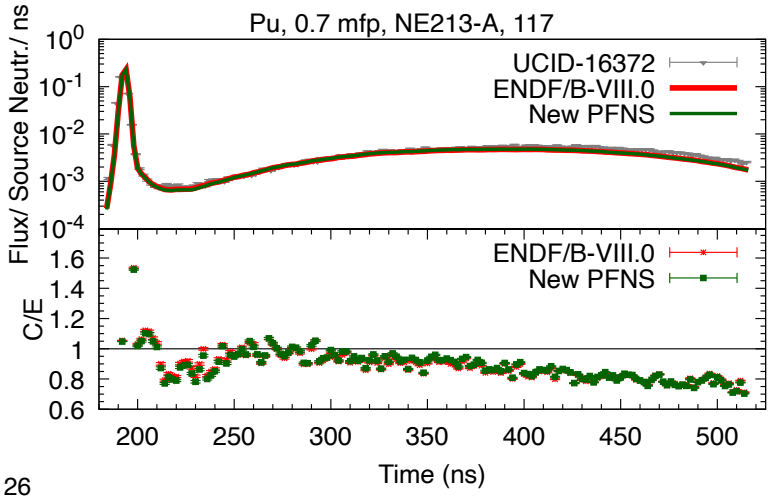
Benchmarking (green: change within VIII.0+ MC unc., red: change outside of VIII.0+MC unc., unc. on last digit).

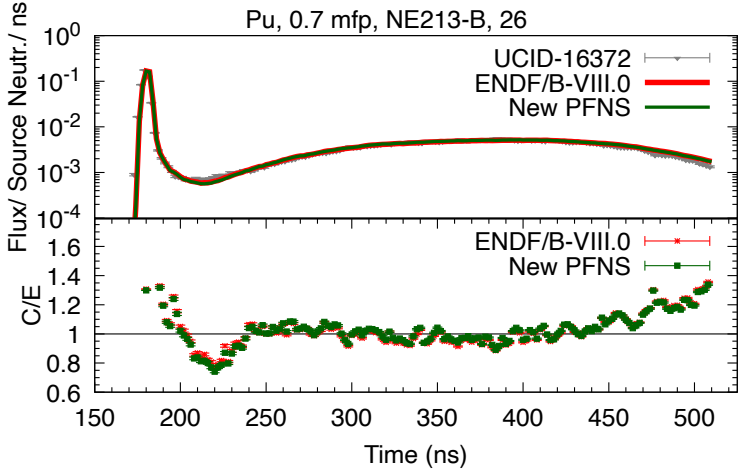
Jezebel	Keff	Pu9(n,2n)/(n,f)	Pu9(n,g)/(n,f)	U8/U5(n,f)	Np/U5(n,f)	U3/U5(n,f)	Pu9/U5(n,f)
VIII.0	1.00069(1)	0.00230(5)	0.0345(2)	0.212(1)	0.9768(5)	1.566(7)	1.427(6)
VIII.0+new PFNS	0.99941(1)	0.00225(5)	0.0354(2)	0.209(1)	0.9660(5)	1.566(7)	1.424(6)

Flattop-Pu	Keff	Pu9(n,2n)/(n,f)	Pu9(n,g)/(n,f)	U8/U5(n,f)	Np/U5(n,f)
VIII.0	0.99971(1)	0.00197(4)	0.0455(1)	0.1800(9)	0.8591(4)
VIII.0+new PFNS	0.99857(1)	0.00193(4)	0.0464(1)	0.1775(9)	0.8499(4)

Benchmarking Pulsed Sphere: little change.







^{239}Pu PFNS evaluation: potential release candidate.

- Thermal: INDEN PFNS, exp. only evaluation.
- 0.5-2.0: evaluation separately at each E_{inc} with LAM and experimental data.
- 3-30 MeV: evaluation across all E_{inc} with LAM and experimental data.
- CEA mean values were corrected for ratio-effect.
- Change in k_{eff} needs to be counter-balanced, pulsed spheres ok, RR ok.